REMARKS

Claims 1-18, 20-26, 45-46 and 48-54 were pending and stood rejected. Claims 1 and 48-49 have been cancelled in this amendment. Claims 2-3, 7-12, 14, 20-21, 45, and 54 were amended. Claims 55-57 were added. Claims 2-18, 20-26, 45-46 and 50-57 remain in the application.

The previous amendment was objected to as incorrectly showing amended language of Claim 1. In this amendment, Claim 1 has therefore been cancelled and replaced by Claim 55.

Claims 1-9, 11-22 and 24-26 stand rejected under 35 U.S.C. 103(a) as being unpatentable over W. Snyder et al., "Optimal Thresholding-A New Approach", Pattern Recognition Letters, II, (1990), pages 803-810, (hereafter Snyder 90) in view of N. Neves et al., "A Study of Non-Linear Optimization Problem Using a Distributed Genetic Algorithm", International Conference on Parallel Processing, 1996 (hereafter Neves 96). Claims 10 and 23 stands rejected under 35 USC 103(a) as being unpatentable over Snyder 90 in view of Neves 96 and further in view of D. Levine, Statistics for Managers Using Microsofts Excel, Chapter 14 – Multiple Regression Models, Prentice-Hall, 1999. Claims 45-50 and 52-54 stand rejected under 35 USC 103(a) as being unpatentable over Snyder 90 in view of Neves 96, and further in view of M. Mitchell et al., Gender Algorithms and Artificial Life, Artificial Life, Volume 1 (3), 1994.

Claim 1 has been replaced by Claim 55, which states:

> 55. A method of fitting a plurality of sub-population functions to digital image data, comprising the steps of:
>
> defining a plurality of collections and a set of bins, each of said collections having an initial set of functions corresponding to different ones of said bins, said functions each having one or more function parameters;
>
> determining a plurality of fitness values, each of said fitness values defining a difference between a respective one of said collections and the data;
>
> comparing each said fitness value to stopping criteria to determine if said stopping criteria is satisfied;

if, at said comparing step, said stopping criteria is not satisfied, then altering said plurality of collections to provide a next generation of said collections; and

following said altering step, iterating said determining, comparing, and altering steps;

wherein one or more of said altering steps further comprise:

randomly selecting one of said collections of the respective said next generation and one of said bins;

if the randomly selected bin and one of said functions in the randomly selected collection correspond, deleting said corresponding function;

if the randomly selected bin has no corresponding function in the randomly selected collection, adding to the randomly selected collection a new function corresponding to said randomly selected bin, said new function having one or more randomly selected function parameters.

Claim 55 is supported by the application as filed, notably the original claims and at page 22, line 26 to page 24, line 20.

Claim 55 requires iterating determining, comparing, and altering slips:

wherein one or more of said altering steps further comprise:

randomly selecting one of said collections of the respective said next generation and one of said bins;

if the randomly selected bin and one of said functions in the randomly selected collection correspond, deleting said corresponding function;

if the randomly selected bin has no corresponding function in the randomly selected collection, adding to the randomly selected collection a new function corresponding to said randomly selected bin, said new function having one or more randomly selected function parameters.

These steps are unlike Snyder which as the Office Action indicates, does not even disclose a plurality of collections each having more than one function.

The randomly selecting and replacing steps of Claim 55 are unlike the mutation operators in the other cited references. Neves 96 simply describes mutation in terms of a particular rate:

> "The first step in the study was to find a good set of configuration values for the genetic algorithm. They include different crossover and mutation rates, . . ." (Neves 96, page II-31, first column, last full paragraph and paragraph continuing to second column).

Mitchell states:

> "GAs [genetic algorithms] as they are known today were first described by John Holland in the 1960s and further developed by Holland and his students and colleagues at the University of Michigan in the 1960s and 1970s. Holland's 1975 book Adaptation in Natural and Artificial Systems [Footnote: MIT Press, Cambridge, MA 1992, Second Edition, (First Edition 1975)] presents the GA as an abstraction of biological evolution and gives a theoretical framework for adaptation under the GA. Holland's GA is a method for moving from one population of "chromosomes" (e.g. bit strings representing organisms or candidate solutions to a problem to a new population, using selection together with the genetic operators of crossover, mutations and inversion. Each chromosome consists of "genes" (e.g., bits), with each gene being an instance of a particular "allele" (e.g., 0 or 1). Selection chooses those chromosomes in the population that will be allowed to reproduce, and decides how many offspring each is likely to have, with the fitter chromosomes producing on average more offspring than less fit ones. Crossover exchanges subparts of two chromosomes (roughly mimicking secual recombination between two single-chromosome organisms); mutation randomly changes the values of some locations in the chromosome; and inversion reverses the order of a contiguous section of the chromosome." (Mitchell, page 2, third paragraph)
>
> "In spite of the foregiving, the vast majority of current GA implementations use a simple binary alphabet linearly ordered along a single haploid string." (Mitchell, page 18 initial, incomplete paragraph)
>
> "One reason that binary linearly ordered representations are so popular is that the standard mutation and crossover operators can be applied in a

problem independent way. Other operators have been experimented with in optimization settings, but no general purpose operators have been widely adopted since the advent of GAs." (Mitchell, page 18, second full paragraph).

Unlike Neves and Mitchell, Claim 55 has a deletion step that removes a function corresponding to a randomly selected bin and an addition step that adds a function corresponding to a randomly selected bin that had earlier lacked a corresponding function. The deleting step removes a function rather than randomly changing that function. The adding step adds a function having randomly selected function parameters. The added function does not replace the deleted function. The randomly selecting, deleting, and adding steps of Claim 55 allow "a new sub-population to be entered into a mixture or a current sub-population to be removed, thereby effectively changing the number of probability density functions". (application, page 24 lines 18-20)

The randomly selecting, deleting, and adding steps of Claim 55 are not a binary mutation operator and are unlike Mitchell's mutation that "randomly changes the values of some locations in the chromosome". (Mitchell, page 18, second full paragraph; "other operators" are acknowledged generically, but not further described at page 18, second full paragraph.)

Neves lacks the randomly selecting, deleting, and replacing steps and simply refers to a mutation rate. Neves further teaches against allowing a new sub-population to be entered and a current sub-population to be removed as specified by the randomly selecting, deleting, and adding steps of Claim 55. Neves only changes coefficients of a single function. Neves states:

"The model function used in the experiments consisted of a sum of polynomirals and exponentials.

* * *

The particular function used in the experiment has four polynominals and two exponentials, which correspond to eight unknowns, and consequently to an eight-dimension search space. The model function had the form:

$$f(t,X) = x_1 + x_2 t + x_3 t^2 + x_4 t^3 + x_5 e^{x_6 t} + x_7 e^{x_8 t}$$

"The experimental data was generated using the model function plus a stochastic factor. All coefficients of the function were floating-point numbers, with values belonging to the range (-10.00, 10.00)." (Neves, page II-31, left column, section 4, second and third paragraphs).

The combination of the cited references teaches no more than the cited references taken separately.

Claims 2-13 are allowable as depending from Claim 55, and as follows.

Claims 7-8 were amended to state:

7. The method of Claim 2 wherein said altering step is accomplished by evolving said plurality of collections according to a genetic, wherein said genetic algorithm includes a mutation operator comprising said randomly selecting, deleting, and adding steps.

8. The method of Claim 7 wherein said evolving includes crossover followed by said mutation operator.

Amended Claims 7-8 are supported and allowable on the same grounds as Claim 55.

Added Claims 56-57 are allowable as depending from Claim 55 and as follows. Claims 56-57 state:

56. The method of claim 55 wherein said altering further comprises randomly applying a genetic crossover operator to provide one or more pair of offspring collections, said deleting and adding being limited to said offspring collections.

57. The method of claim 56 wherein said crossover operator is a single-point genetic crossover operator.

Claims 56-57 are supported by the application as filed, notably at page 24, lines 8-10. The cited references are silent as to use of a particular crossover operator with the randomly selecting, deleting, and adding steps of Claim 55.

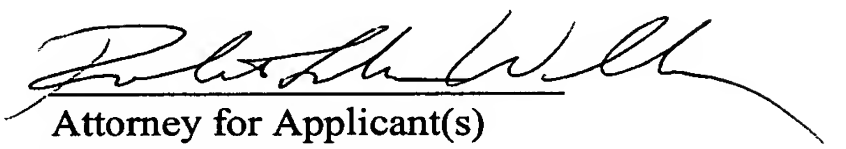
Claims 14, 45, and 54 are supported and allowable on the same grounds as Claim 55.

Claims 15-18, 20-26, 46, and 50-53 are allowable as depending upon allowable independent claims.

It is believed that these changes now make the claims clear and definite and, if there are any problems with these changes, Applicants' attorney would appreciate a telephone call.

In view of the foregoing, it is believed none of the references, taken singly or in combination, disclose the claimed invention. Accordingly, this application is believed to be in condition for allowance, the notice of which is respectfully requested.

Respectfully submitted,



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Enclosures: Request for Three Month Extension of Time
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